



Descriptions of the last instar larvae of two species of *Megalestes* Selys from Yunnan, China (Odonata: Zygoptera: Synlestidae)

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(Received 20 May 2020; accepted 7 July 2020)

The final stadium larvae of *Megalestes micans* Needham, 1930 and *M. kurahashii* Asahina, 1985 are described and illustrated from Yunnan Province, China, and a key to the known larvae of seven species of the genus *Megalestes* is provided. All exuviae will be stored at the Invertebrate Collection of the College of Agriculture and Life Sciences, Dali University, Dali, Yunnan, China.

<http://www.zoobank.org/urn:lsid:zoobank.org:pub:461E0535-7F93-4B2E-A53A-F288D6310D73>

Keywords: *Megalestes micans*; *Megalestes kurahashii*; dragonfly

Introduction

The genus *Megalestes* contains 18 species, all of which are confined to the Oriental region. Twelve species have been recorded from China (Zhang, 2019). To date, the larval stage of *Megalestes* has been described for five species, *M. chengi* Chao, 1947, *M. heros* Needham, 1930, *M. irma* Fraser, 1926, *M. maai* Chen, 1947 and *M. major* Selys, 1862 (Chao, 1947; Laidlaw, 1920; Matsuki and Lien, 1978; Needham, 1911; Xu, 2020). The larval characters of genus *Megalestes* Selys were provided by Xu (2020). In this paper, we describe the final instar larvae of two species of *Megalestes* for the first time, *M. micans* Needham, 1930 and *M. kurahashii* Asahina, 1985 from Yunnan Province, China.

Materials and methods

During fieldwork in Mt. Jizushan, Binchuan Town, Yunnan Province, China conducted in June 2019, the larvae of *M. kurahashii* and *M. micans* were found in a small pond full of fallen leaves. The larvae were collected using a dip net, and were reared in a laboratory in plastic containers. All the in vivo pictures were taken in the field and laboratory, with a digital camera (Nikon D7200, Thailand), measured, and characters photographed in the laboratory using the Keyence VHX-5000 (made in Japan) digital microphotography system. All species identifications were confirmed by the adults that emerged. Mandibular terminology and formulae follow Watson (1956), and S means abdominal segment(s).

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Figure 1. Larva of *Megalestes micans*, dorsal view.

Descriptions of larvae

Megalestes micans Needham, 1930

(Figures 1, 2, 3a, 6a–c)

Material examined. 1♀, larva, 20 May 2018, Sanjiacun Stream (25.51°N, 100.38°E, altitude 2129 m), Fenyi Town, Dali, Yunnan Province, China, Yi-Yuan Zhang leg; 3♂, 2♀, larvae, 1 June 2019, Mt. Jizushan (25.51°N, 100.20°E, altitude 2540 m), Binchuan Town, Dali, Yunnan Province, China, Guo-Hui Yang leg. Several of these larvae were successfully reared to adults in the laboratory.

Body smooth and slender, with irregular black markings in the living individual (Figures 1, 2 m, 6a, b).

Head. Wider than long, about 1.4 times as long as length. Occipital margin concave. Labrum smooth, light brown, its edge dark, surface smooth. Compound eyes black and prominent. Antenna filiform in shape, 7-segmented, the third is the longest. Length of each antennal segment (mm): 0.70, 1.9, 2.1, 1.2, 1.3, 0.6, 0.5 (Figure 2a). Prementum $1.7 \times$ longer than wide, without mental and lateral setae (Figure 2b, c). Median lobe with uniform marginal denticles; median cleft shallow. Labial palp slender, with two end hooks of unequal size, the inner one longer and larger than the outer; movable hook long and acuminate, curved inward medially (Figure 2b–d). Mandibles brown, formula: L 123450 ab / R 12345 y ab (Figure 2e–h), five incisors rounded, $4 > 5 > 3 > 2 > 1$, $a > b$ in both mandibles, additional tooth y evident on the right of mandible. Maxillae with seven hooks, of which four are long and three are short, all sharply pointed, basally with short setae; maxillary palp bearing dense, long setae (Figure 2i, j).

Thorax. Light brown, smooth, with irregular black marks. Prothorax rectangular. Synthorax trapezoidal, elongate. Legs long and slender, marked with yellow bands each on distal end of femur and tibia (Figure 1). Wing cases parallel, forewing cases reaching to hind border of S3, hind wing extending to middle of S4 (Figure 2m).

Abdomen. Slender and cylindrical, brown or yellowish brown dorsally with paired blackish brown stripes and dots on each segment; S10 keeled dorsally, bearing numerous small spines dorsally and ventrally; lateral spines small, present on S5–9. Caudal gills (both lateral gills and median gill) leaf shaped, with black mid-ribs and numerous black spots (Figure 2k–m), the markings are more obvious in living larvae (Figure 6a, b). The ovipositor of female long, reaching end of S10 (Figures 2n, 3a).

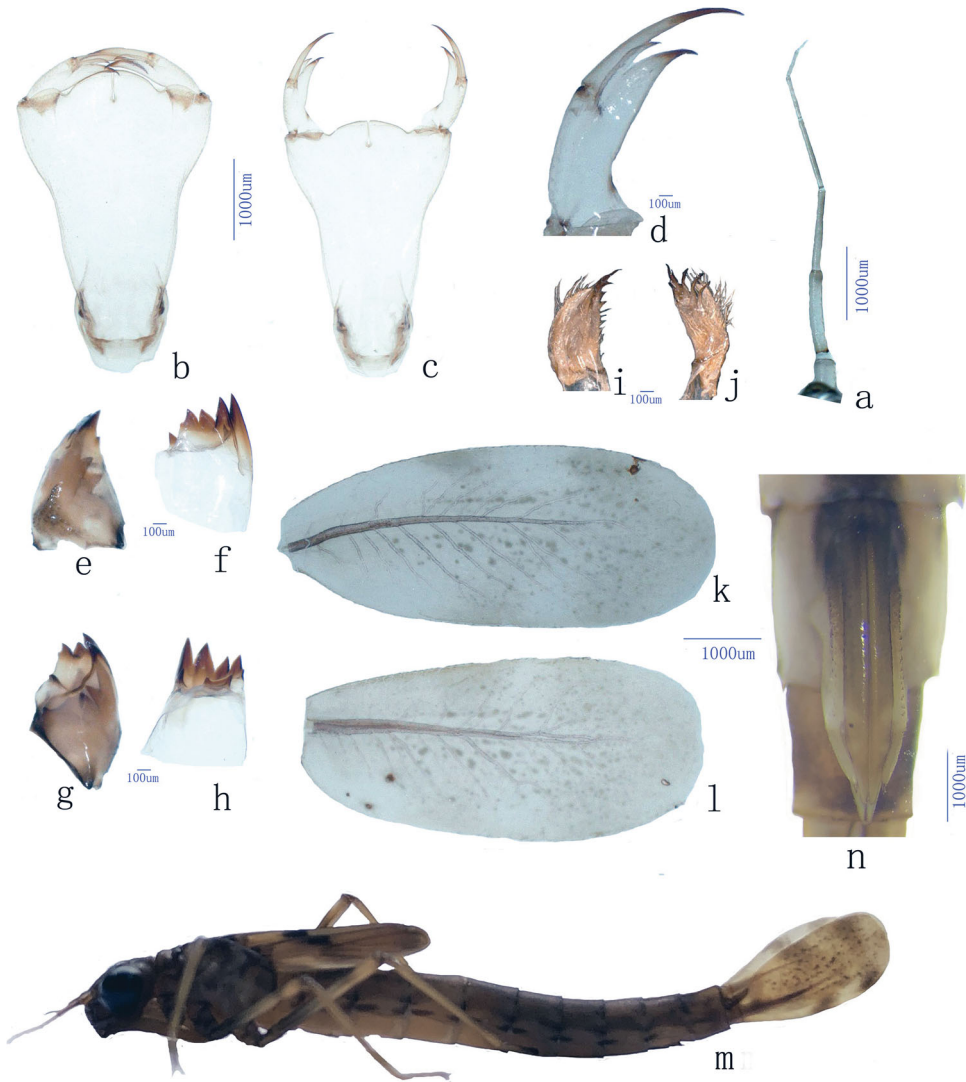


Figure 2. Morphological details of the final stadium larva of *M. micans*: (a) left antenna; (b) prementum and labial palps, ventral view; (c) same, dorsal view; (d) labial palp, ventral view; (e) right mandible, posterior view; (f) same, inner surface; (g) left mandible, posterior view; (h) same, inner surface; (i) left maxilla; (j) right maxilla; (k) lateral gill, lateral view; (l) median gill, lateral view; (m) final stadium larva, lateral view; (n) female ovipositor, ventral view.

Measurements (mm)

Body length 32–35; length of abdomen 18–19; maximum head width 5; length of hind femur 6–7; lateral of caudal gills 7–8.

Megalestes kurashii Asahina, 1985

(Figures 3b, 4, 5, 6a, d, e)

Material examined. 4♂, 4♀, larvae, 1 June 2019, Mt. Jizushan (25.51°N, 100.20°E, altitude 2540 m), Binchuan Town, Yunnan Province, China. Guo-Hui Yang leg. Several of these larvae were successfully reared to adults in the laboratory.



Figure 3. Comparison of the abdominal ends of the female larvae of *M. micans* and *M. kurahashii*: (a) *M. micans*, lateral view; (b) *M. kurahashii*, lateral view.



Figure 4. Larva of *Megalestes kurahashii*, dorsal view.

Body dark brown with irregular black markings, caudal gills almost black (Figures 4, 5j).

Head. Mouthparts very similar to *M. micans* (Figure 4), but prementum almost 2.1 times longer than wide (Figure 5a–g).

Thorax. Very similar to *M. micans* but hind wing cases extending to basal 1/3 of S4 (Figure 5j).

Abdomen. Dark brown dorsally, with paired blackish brown stripes and dots on each segment. Lateral spines small, present on S6–9. Ovipositor of female extending to basal 2/3 of S10 (Figures 3b, 5i). Caudal gills (both lateral gills and median gill) almost black, with light brown spots (stripes) as follows: four small irregular light brown spots at the base and middle, a large light stripe apically (Figure 5h, j).

Measurements (mm)

Body length 35–37; length of abdomen 19–20; maximum head width 5; length of hind femur 6–7.5; lateral caudal gills 7–8.

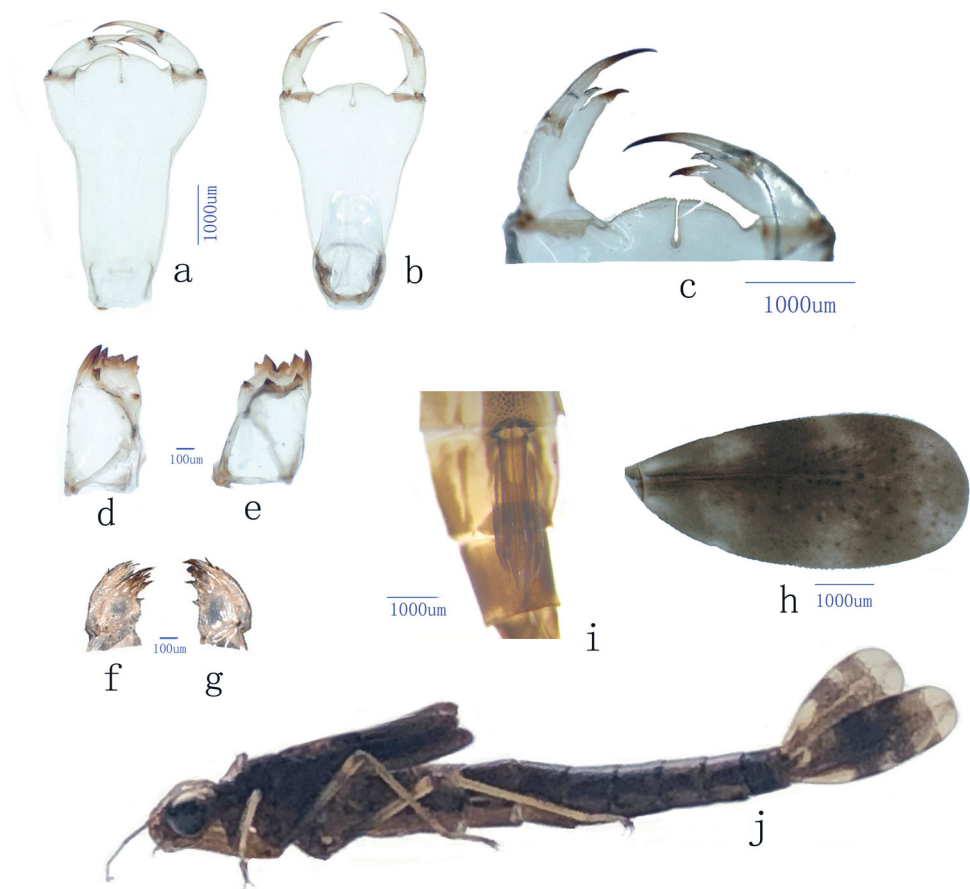


Figure 5. Morphological details of the final stadium larva of *M. kurashii*: (a) prementum and labial palps, ventral view; (b) same, dorsal view; (c) labial palps, ventral view; (d) left mandible, posterior view; (e) right mandible, posterior view; (f) left maxilla; (g) right maxilla; (h) lateral gill, lateral view; (i) female ovipositor, ventral view; (j) final stadium larva, lateral view.

Differential diagnosis

The larvae of *M. kurashii* can be easily separated from that of *M. micans* by caudal gill color and length of female ovipositor (caudal gills almost black and female ovipositor extending to basal 2/3 of S10 in *M. kurashii*, but caudal gills with black stripes and female ovipositor reaching end of S10 in *M. micans*) (Figures 3, 6a).

Of the seven known larvae of *Megalestes* species, the larvae of both *M. kurashii* and *M. micans* have black streaked caudal gills, easily distinguishing them from other known *Megalestes* larvae (Table 1).

A key to the larvae of seven species of the genus *Megalestes*

- 1. Prementum long, about 3 × longer than wide.....*M. heros*
— Prementum no more than 3 × longer than wide.....2
- 2. Caudal gills with black streaks and spots.....3



Figure 6. Larvae and adults of *M. kurahashii* and *M. micans*: (a) larvae of *M. kurahashii* and *M. micans* photographed at Mt. Jizushan (Binchuan Town, Dali, Yunnan) on 1 June 2019, photo by Guo-Hui Yang; (b) larva of *M. micans* in laboratory; (c) male adult of *M. micans* photographed at Fenyi County (Dali City, Yunnan Province) on 3 August 2017, photo by Guo-Hui Yang; (d) final instar larva of *M. kurahashii* in the laboratory; (e) male adult of *M. kurahashii*, photographed at Mt. Cangshan (Dali City, Yunnan Province) on 13 October 2017, photo by Hao-Miao Zhang.

Table 1. Comparison of characters of the larvae of seven species of the genus *Megalestes* Selys, 1862.

Character	<i>M. heros</i>	<i>M. irma</i>	<i>M. major</i>	<i>M. maaï</i>	<i>M. chengi</i>	<i>M. micans</i>	<i>M. kurahashii</i>
Length of abdomen (mm) (including caudal gills)	37 ~ 40	18 ~ 25	25 ~ 26	31 ~ 33	25 ~ 28	32 ~ 35	34 ~ 37
Premmentum (length/width ratio)	= 3	< 3	< 3	1.5	< 3	1.7	2.1
Hook of lateral lobe (inner/outer ratio)	1/3	½	½	1/3	1/3	1/3	1/3
Caudal gill color (black spots)	Without	Numerous	Numerous	Numerous	Four large and numerous	Numerous and black streaks	Almost black
Wing cases length	Middle of S3	Middle of S4	Base of S5	Middle of S4	Middle of S3	Middle of S4	Base of S4

- Caudal gills without black streaks.....4
- 3. Female ovipositor reaching end of S10.....*M. micans*
- Female ovipositor extending to basal 2/3 of S10.....*M. kurahashii*
- 4. Inner end hook of labial palp long, about 1/2 as long as the outer movable hook.....5
- Inner end hook of labial palp on more than 1/2 as long as the outer movable hook.....6
- 5. Lateral teeth on abdominal segment 5 absent.....*M. major*
- Lateral teeth on abdominal segment 5 present.....*M. irma*
- 6. Median lobe of prementum short, about 1.5 × longer as maximum width.....*M. maai*
- Median lobe of prementum more than 1.5 × longer as maximum width.....*M. chengi*

Acknowledgements

I am grateful to Dr Qi-Han XU for his kind help in providing literature necessary for the present study, and thank Dr Ben-Yong Mao for helping with the fieldwork. This project was supported by the Joint Project of Yunnan Local Undergraduate Colleges and Universities (No. 2018 FH001030) and the Project of Key Laboratory of Insect Resources Conservation and Utilization in Western Yunnan, Baoshan University (YJF [2019] No. 57).

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